Proceedings of the Iowa Academy of Science

Volume 20 | Annual Issue Article 15

1913

Nitrogen in Rain and Snow: Second Paper

Nicholas Knight

NITROGEN IN RAIN AND SNOW.

Second Paper.

By Nicholas Knight.

In the proceedings of the Iowa Academy of Science for 1911, we described a series of experiments to show the amount of nitrogen in rain and snow, which we carried on during the year 1910. The work described in this paper has to do with a series of experiments in the same line during some months of 1911-12. During this period we collected twenty-seven samples altogether, fourteen of which were snow, and thirteen were rain or rain and snow. There were sixty-nine inches of snow and about five inches of rain.

We collected the samples in two enameled pans, each about twenty inches in diameter. The samples were contained in glass stoppered bottles until the determinations were made, and kept as free as possible from contamination. There was not always a sufficient amount of the sample available to make the chlorine test. Our method for the chlorine was to evaporate 500 c.c. of the sample to dryness on the water bath, then to dissolve the residue in 50 c.c. distilled water, and titrate with tenth normal silver nitrate solution, using neutral potassium chromate solution as the indicator.

The oceans are doubtless the source of the chlorine. The salt spray from the waves as they beat upon the shore is caught by the winds and borne to the interior of the continent. We found chlorine in each sample examined for it.

In the experiments described in our previous paper, we determined the nitrates by reducing to ammonia with aluminum foil in alkaline solution. The nitrate determinations of the present paper were made by the phenolsulphonic method, which seems to give lower results than the reduction with nascent hydrogen.

TABLE I.

Date	Nitrite N in in 1,000,000 pts. of the water	Nitrate N in 1,000,000 pts. of the water	Free Ammonia in 1,000,000 pts. of the water	Albuminoid ammonia in 1,000,000 pts. of the water	Chlorine parts per million	Precipitation
December 20	0.23	0.40	0.82	0.51	----------	1/8 in. rain and snow
December 25	0.06	0.22	0.29	0.15	----------	3 in. snow
December 26	0.08	0.14	0.058	0.29	----------	4 in. snow
December 30	0.015	0.14	0.216	0.16	0.284	4 in. snow
January 9	0.08	0.32	0.11	0.16	7.1	3 in. snow
January 13	0.075	0.28	0.23	0.30	3.55	4 in. snow
February 1	0.03	0.48	0.33	0.11	0.71	2 in. snow
February 13	0.09	0.34	0.36	0.43	3.55	4 in. snow
February 24	0.06	0.04	0.56	0.21	----------	1-10 in. rain and snow
February 25	Trace	0.56	1.64	0.33	2.13	8 in. snow
March 2	Trace	0.72	0.29	0.29	2.485	6 in. snow
March 11	0.01	0.40	0.41	0.30	2.13	4 in. snow
March 14—I	0.07	0.84	0.47	0.36	4.61	3 in. snow
March 14—II	0.08	0.76	0.47	0.36	2.13	4 in. snow
March 20	0.01	0.44	0.44	0.23	1.8	10 in. snow
April 13	Trace	0.12	0.56	0.23	1.8	1/2 in. rain
April 17—I	0.01	0.18	0.47	0.33	4.26	1 in. rain
April 17—II	0.02	0.34	0.52	0.36	2.84	6 in. snow
April 21	Trace	0.48	0.41	0.50	----------	1/8 in. rain
April 25	0.01	1.00	0.58	0.70	----------	1/8 in. rain
April 28	0.36	0.88	0.70	0.66	5.68	1/2 in. rain
May 2	Trace	0.22	0.67	----------	----------	3/4 in. rain

D	Nitrite N in 1,000,000 parts of the water	Nitrate N in 1,000,000 pts. water	Free Ammonia in 1,000,000 parts of the water	Albuminoid Ammonia in 1,000,000 parts of the water	Chlorine parts in a million	Precipitation
May 10	0.25	0.30	0.81	0.51	----------	1/4 in. rain
May 11—I	Trace	0.32	0.79	0.68	----------	3/4 in. rain
May 11—II	0.052	0.22	0.84	0.78	----------	1/4 in. rain
May 14	0.38	0.30	0.85	0.70	----------	3/8 in. rain
May 20	0.40	0.60	0.91	0.78	----------	1/8 in. rain
May 21	0.01	0.44	0.85	0.80	----------	1/8 in. rain

TABLE II.

POUNDS PER ACRE.

Date	N in Nitrites	N in Nitrates	N in Free Ammonia	N in Albuminoid Ammonia	Total
1912					
December 20	0.0174	0.0303	0.0620	0.0386	0.1483
December 25	0.0042	0.0154	0.0203	0.0105	0.0504
December 26	0.0073	0.0091	0.0053	0.0264	0.0481
December 30	0.0014	0.0127	0.0197	0.0528	0.0866
1913					
January 9	0.0054	0.0216	0.0075	0.0108	0.0453
January 13	0.0068	0.0253	0.0208	0.0272	0.0801
February 1	0.0014	0.0224	0.0154	0.0051	0.0443
February 13	0.0082	0.0309	0.0328	0.0390	0.1109
February 24	0.0014	0.0008	0.0130	0.0049	0.0201
February 25	Trace	0.1016	0.2977	0.0599	0.4598
March 2	Trace	0.0980	0.0325	0.0325	0.1630
March 11	0.0010	0.0363	0.0347	0.0254	0.0974
March 14—I	0.0070	0.0571	0.0270	0.0210	0.1151
March 14—II	0.0070	0.0690	0.0290	0.0230	0.1280
March 20	0.0020	0.0998	0.0822	0.0420	0.2260
April 13	Trace	0.0136	0.0934	0.0384	0.1454
April 17—I	0.0020	0.0408	0.1066	0.0749	0.2243
April 17—II	0.0027	0.0463	0.0583	0.0403	0.1476
April 21	Trace	0.0136	0.0096	0.0117	0.0349
April 25	0.0002	0.0283	0.0135	0.0163	0.0583
April 28	0.0408	0.0998	0.0654	0.0693	0.2753
May 2	Trace	0.0330	0.0875	0.0862	0.2067
	0.1162	0.9067	1.1342	0.7562	2.9133
May 10	0.0142	0.0170	0.0361	0.0230	0.0903
May 11—I	Trace	0.0545	0.1107	0.0953	0.2605
May 12—II	0.0029	0.0125	0.0392	0.0362	0.0908
May 14	0.0646	0.0510	0.1200	0.0981	0.3337
May 20	0.0113	0.1200	0.0214	0.0182	0.1709
May 21	0.0028	0.0125	0.0199	0.0187	0.0539
	0.2120	1.1742	1.4815	1.0457	3.9134

We desire to express our hearty thanks to W. E. Morling and John W. Liddle for conducting the experiments described in the foregoing.